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# Liberalising European electricity markets: opportunities and risks for a sustainable power sector

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**Abstract**

The process of liberalising European electricity markets, encompassing a wide range of restructuring activities, has mainly been spurred by the attempt to increase the economic efficiency of the whole sector. This process might be used to trigger a development towards a sustainable power sector by increasing the use of renewable energy sources and enhancing energy efficiency on the supply and demand side. However, by taking a closer look at the current trends of the European electricity markets, it becomes obvious that the liberalisation not only implies opportunities but also risks for the creation of a sustainable power sector. Many of these risks are due to market distortions and imperfections caused by the delay in creating a fully functional single European market. Thus, in the short-term, the market liberalisation tends to constitute more risks than opportunities without government actions to prevent these risks. In the long run, though, the efficiency gains of the sector and the appearance of new market factors are likely to bring forth the opportunities of liberalisation and actively foster a transformation towards a sustainable electricity sector.


*Keywords:* Electricity market liberalisation; European Union; Sustainable development; Renewable energy; Energy efficiency; Energy services

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## 1. Introduction: the liberalisation of European energy markets

After the 1997 decision of the European Union to liberalise its markets for energy supply, the electricity and gas markets of the European Union witnessed their most comprehensive restructuring since the existence of a public energy supply sector. The power sector took the lead in opening up for competition, closely followed by the gas supply. This will enable all business consumers to freely choose their supplier by mid-2004. Private households will be able to switch suppliers by the end of 2007. Both end-user groups so far had no choice between competing offers for electricity provision as they had to rely on regional or national monopolies [1,2].

With the liberalisation of the power sector, the EU opens up a new chapter of market regulation. So far, the energy policy maintained that with a need of grid-based supply and in the absence of storage possibilities for electricity, only a state-run monopoly would be able to safeguard the overall aims of electricity supply [3,4]. This view has changed, since doubts occurred on whether the security of energy supply and the protection of the environment and scarce resources was maintained cost-efficiently [5,6]. Even if the security of the energy supply was guaranteed, cross-country studies on end-users' prices for power consumption disclosed huge price spreads between the US and EU countries since the 1970s.

Remarkably, these studies show that mostly the liberalised markets of some of the federal US states as well as those of England and Wales guaranteed the lowest prices of all countries examined [7,8]. This spurred the European Commission to propose plans to liberalise the national European markets, leading to a common market for electricity. The plans culminated in the 1996 directive on the internal market for electricity which stipulates that increasing shares of electricity markets must be opened to competition, beginning with bulk consumers [9,10]. As the 1996 directive required only minimum shares for market opening, but otherwise leaves the implementation of the directive to the member states (subsidarity principle),

Table 1
Declared market opening shares of the EU member states' electricity markets in 2001 [40]

| | Market opening share in 2001 (%) | Date for full market opening |
|---|---|---|
| Austria | 100 | 2001 |
| Belgium | 52 | 2004/2007 |
| Denmark | 35 | 2004/2007 |
| Finland | 100 | 1997 |
| France | 30 | 2004/2007 |
| Germany | 100 | 1999 |
| Greece | 34 | 2004/2007 |
| Ireland | 40 | 2004/2007 |
| Italy | 45 | 2004/2007 |
| Luxemburg | 57 | 2004/2007 |
| Netherlands | 63 | 2004/2007 |
| Portugal | 45 | 2004/2007 |
| Spain | 55 | 2004/2007 |
| Sweden | 100 | 1998 |
| UK | 100 | 1998 |

this has led to a highly heterogeneous execution of the directive (Table 1). Whereas for example Germany has followed the lead of the UK, Sweden or Finland and fully liberalised its electricity market in 1998, other countries like France, Denmark, Belgium, Greece, Italy and Luxembourg are more cautious in their proceeding.

Recent end-user price surveys tend to support the link between liberalisation and lower power prices. However, not much is said about the possibility that the reform of the electricity market may trigger or hinder those that support the aim of environmentally benign energy use as well. The aim of this article is to review opportunities and risks for a sustainable power supply that market liberalisation offers. Therefore, we shortly discuss the characteristic elements of the power market liberalisation in the EU in Section 2. In Section 3, the impacts of these elements for a sustainable power sector will be discussed in detail. Section 4 sums up the analysis and draws an initial conclusion, whether and in which aspects market liberalisation tends to hinder or to foster a sustainable electricity provision.

## 2. Characteristics of power market liberalisation

The central characteristic of a liberalised market is the consumers' choice between competing suppliers. This strategy of ‘‘empowering the consumer’’ can only be achieved by banning all exclusive supply contracts on national and regional levels (prohibition of demarcation and concession contracts). To introduce competition, the stages generation, power transport and power sales of the electricity value chain have to be separated [11]. The unbundling of the formerly vertically integrated domains is essential to guarantee the consumers' freedom of choice. Hereby, the competitive stages generation and sales are separated from the

transmission, which continues to hold a key position as a natural monopoly in the centre of the value chain.

To overcome the status of the transport monopoly, all power generators have to have non-discriminatory access to the transmission and distribution networks, the so-called third-party access (TPA). The access conditions can either be specified in advance for all suppliers by the government (the so-called regulated third-party access, RTPA) or freely negotiated between supplier and transmission system operator as the case arises (negotiated third-party access, NTPA) [12]. In both cases, a national regulatory institution or an antitrust division will assure that the transport system operator does not abuse his position. Therefore, transport operation and generation or sales activities have at least to be accounted separately. A new proposition of the European Commission also discusses organisational and legal unbundling [13].

On the level of local distribution networks, the government loses its exceptional position as unique power distributor or—like in Germany—is only allowed to proceed with restrictions and within short time limits [14]. Thus, the coordination of power supply and demand is now accomplished by new market actors like power exchanges or power contract brokers. In spite of their diminishing role within the power sector, the public authorities still have the task to design a suitable framework for the power market and to carry out an energy policy on this market which allows for the realisation of the aims of energy policy, especially focussing on incentives for the development of a sustainable electricity sector [15].

The dimension of a public intervention in the liberalised market will most likely depend upon the primary environmental effect produced by those markets. A sustainable power sector is usually characterised by sparing fossil resources and thus preventing emissions of local air pollutants and global greenhouse gases. To meet these characteristics, a large share of renewable energy sources should be used to substitute fossil resources. As the substitution strategy is at the current status quo limited to peak load supply, efficient generation plants like combined heat and power plants (CHP) can help sparing fossil fuels. Current grid-losses could be minimised by switching to a decentralised, close-to-consumer feed-in structure. At last, efficiency on the demand side and the stabilisation for the need of energy services can play a major role in paving the way for a sustainable electricity supply and use [5].

Whilst the liberalised markets theoretically offer both opportunities and risks for the restructuring towards sustainability, the real outcome can only be judged on a case to case basis for each single country. However, even if each single national market of the EU has its own specificities and the experience with the environmental consequences of market openings and the creation of a single market for electricity are relatively new and short, some general up-to-date trends can be highlighted which will allow to judge whether the market liberalisation represents more opportunities or risks for sustainability.

## 3. Current trends of electricity market liberalisation and their impact on a sustainable electricity sector

### 3.1. Increasing price competition between suppliers

The most striking consequence of national market liberalisation in EU member countries is the decrease of end-user prices. This price decline is especially remarkable for industrial consumers, whereas household consumer prices tend to decrease very slowly. The extensive use of price competition can be explained by the character of electricity. Electrical power is generally a low-interest product, that is a product only noticed when it is missing [16]. The main reason for this is that consumers generally perceive electricity as homogeneous product. From this point of view, the supply of kilowatt–hours by one distributor equals that of another. In order to attract new customers, distributors have to compete by offering lower end-use prices. They can do so by restructuring the share of fixed base rates and variable demand rates.

Price decreases are especially high for "eligible customers" of those countries that actively have fostered liberalisation [17]. As Figs. 1 and 2 show, industrial and household consumers in proactive countries like Austria, Germany, Finland, Sweden and the UK witness strong decreases under the EU average since the market opening. On the contrary, more cautious countries like Belgium, France, Greece, Italy and Luxembourg which only fulfil minimum market opening shares still have above-average power prices for both consumer groups.

Despite the recent price increases—which most likely reflect the primary energy price increases and a consolidation of the market structure due to increased co-operations and mergers—there is a general tendency to lower end use-prices. This tendency is likely to become obvious again with further steps of market opening. These price decreases will—ceteris paribus—lead to an increased demand for elec-

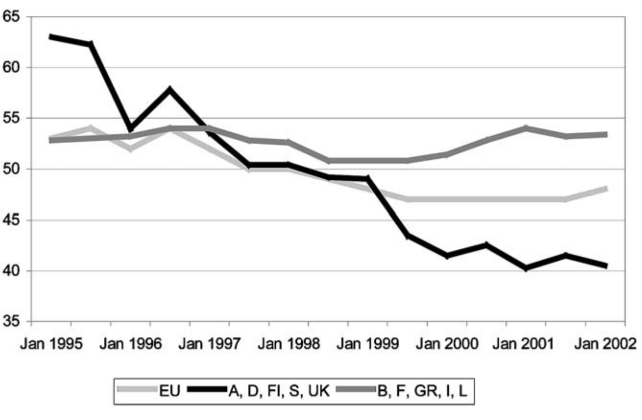



Fig. 1. Development of power prices for industrial consumers 1995–2002 (€/MWh)* [40,41]. * Industrial consumers with a demand superior to 24,000 MWh per annum.

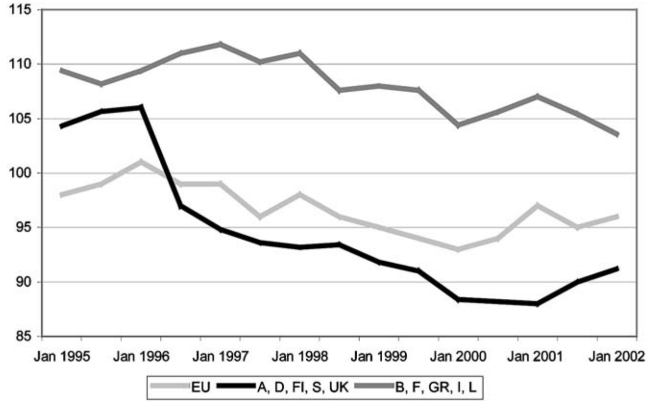



Fig. 2. Development of power prices for household consumers 1995–2002 (€/MWh)** [40,41]. ** Household consumers with a demand inferior or equal to 3.5 MWh per annum.

tricity. The European Commission estimates in its "Green Paper on the Security of Energy Supply" that this *price level-effect* might lead to a boost of demand by up to 20% [18]. This constitutes a risk for sustainable electricity supply in several ways. On the one hand, an increased demand leads to a higher power production, associated with resource depletion and detrimental emissions. On the other hand, the price level-effect principally reduces incentives to increase energy efficiency on the demand side by using efficient consumer electronics (the so-called transformers which convert electricity into energy services) or to curb electricity needs [19,20]. Another negative side-effect of the price decrease is the (partial) compensation of official measures to promote the aims of energy policy. Thus, measures like the taxation of electricity would have to be tightened so as to induce the same incentives for efficiency and demand curb as before the lowered prices. However, as the political discussion in many EU member states shows, tightening measures is unlikely to be a politically feasible solution.

With the purpose of reaching attractive low end-use prices, most suppliers have also been changing their *price structure* since market liberalisation. Virtually in all OECD countries, end-use prices are composed of a fixed base rate (covering fixed costs of electricity provision like network costs and counter provision) and a variable demand rates (per unit of kilowatt–hours). Since variable demand rates constitute the key parameter of competition, suppliers tend to offer a tariff structure with low demand rates and high fixed rates, the latter hardly perceived by customers. Especially for bulk customers, this price structure leads to attractive overall prices. Here again, a low demand rate induces a higher demand or diminishes incentives for demand reduction or demand-side efficiency, respectively.

The increased price competition forces suppliers to minimise production costs. In order to succeed in competition, producers need to recur to efficient production plants and reduce electricity losses during generation and transportation. Both types of energetic losses account for about 60–70% of primary energy input [3].

By lowering them, market liberalisation offers the opportunity of a step by step restructuring of the sector towards energy-efficient plants and a decentralised, close-to-customer feed-in infrastructure which helps to minimise transportation losses. Decentralised electricity production with small efficient plants is usually seen as a key issue for a sustainable electricity sector for two main reasons [21]. Firstly, the energy-efficient power plants like CHP still tend to operate with small capacities. Secondly, the renewable energy sources are more easily used in comparatively small plants.

Here, once again, the experiences of market liberalisation in Great Britain have raised hopes. Whereas Britain historically relied heavily on its domestic coal, the use of natural gas in electricity generation has increased from nearly 0 in 1990 to about 39% in 1999. During the same period, the average primary–secondary energy conversion efficiency of generation plants has increased by roughly 10%. This translates into a reduction of carbon dioxide-emissions, held responsible as the major global warming gas in industrialised countries, by about 27% [19]. However, in spite of the positive empirical evidence and the key role of a decentralised feed-in structure, the chances for the practical application in continental Europe so far seem small. By switching to small plants, generators would have to renounce on economies of scale and economies of scope which are feasible only within a centralised production.

In addition, both renewable energies and decentralised efficient plants like CHP are still in a stage of research and development associated with high R&D costs. To cover these investment costs, producers would need to demand higher prices than other generators that persist on using a conventional primary energy mix in centralised fossil plants. Characteristically, the conventional plants work with partly or fully depreciated investment costs. Combined with a centralised production, this also allows for lower electricity prices [22]. Therefore, conventional plants are more likely to assert in competition than efficient and sustainable technologies or energy sources which still face high cost barriers to market entries. These barriers tend to increase with the price effects of market liberalisation.

The experience of the liberalisation of the German electricity market underlines these doubts. There, CHP and renewable energies were mostly used by local suppliers. With the electricity market liberalisation act of 1998, a fierce price competition could be witnessed which the local suppliers had to face. This led to the shut-down of a large quantity of CHP plants and incited the government to take re-regulatory steps in order to safeguard the existence of local CHP production [23].

Transport losses are more likely to be high on the agenda in a liberalised market, as the transport system operator works independent of power generation and thus focuses on this part of the electricity value chain. This may prove to be one of the biggest opportunities for restructuring towards a sustainable electricity sector. Reducing transport losses helps to spare fossil resources and curb local and global emissions. The to-date experience confirms that government intervention seems to be necessary to promote both renewable energies and efficient generation plants. However, once both energy sources and generation technologies reach readiness for marketing, they are likely to be far more diffused by a liberalised market than

Table 2
Share of switching or renegotiating customers in EU member countries (1998–2002) [40]

| | Eligible industrial consumers | | Eligible commercial consumers/households | |
|---|---|---|---|---|
| | Supplier switch | Supplier switch or renegotiation | Supplier switch | Supplier switch or renegotiation |
| Austria | 20–30% | n.a. | 5–10% | n.a. |
| Belgium | 2–5% | 30–50% | n.e. | n.e. |
| Denmark | n.a. | >50% | n.e. | n.e. |
| Finland | n.a. | >50% | 5–10% | 10–20% |
| France | 10–20% | n.a. | n.e. | n.e. |
| Germany | 20–30% | >50% | 5–10% | 10–20% |
| Greece | 0 | 0 | n.e. | n.e. |
| Ireland | 10–20% | n.a. | n.e. | n.e. |
| Italy | >50% | 100% | n.e. | n.e. |
| Luxemburg | 10–20% | >50% | n.e. | n.e. |
| Netherlands | 20–30% | 100% | n.e. | n.e. |
| Portugal | 5–10% | n.a. | n.e. | n.e. |
| Spain | 10–20% | >50% | n.e. | n.e. |
| Sweden | n.a. | 100% | 10–20% | >50% |
| UK | >50% | 100% | 30–50% | n.a. |

n.a. = not available; n.e. = not eligible.

within a regulated system. In the regulated system, electricity generated from renewable energies or CHP was mostly used in local networks. Transmission system operators usually refused a nationwide feed-in on a large scale by referring to the fluctuating feed-ins that could not be planned in advance. Now, with the liberalised market, network access has to be guaranteed to all producers of electricity once they have signed a purchase contract with end users.

On the whole, an analysis of the opportunities and risks of the liberalisation of European electricity markets soon leads to the conclusion that much depends on the customers' attitudes. Impulses for a sustainable electricity supply will crucially depend on buying decisions. By choosing their supplier or their various electricity "products", end users have a strong influence on the primary energy portfolio or the production plant mix of generators. Customers may want to switch to suppliers of "green" electricity products, which means paying higher prices for electricity out of renewable energies or CHP. So far, end users do not seem apt to take over this crucial role. As empirical evidence shows, only a very small share of eligible customers in EU member countries have taken advantage of the liberty to switch their supplier (Table 2).

This observation especially holds true for household consumers. Whereas in almost all EU countries with partly open electricity markets an average of 15–25% of industrial customers took advantage of the market liberalisation to change the supplier or renegotiate purchase contracts, household customers in continental Europe are very restrictive with only 5–10% switching suppliers (excepting the UK and Sweden) and only 10–20% renegotiating their supply contracts.

The essential prerequisite for increasing the willingness to change suppliers and thus a stronger influence on primary energy structure is the existence of comprehensive information about suppliers and their electricity products. End users need to distinguish conventionally produced electricity from "green electricity", that is power produced by renewable energy sources and efficient plants which spare resources and avoid emissions. So far, the information focuses on price signals, conveying the image that electricity is a homogeneous product. For full information, suppliers would need to inform about qualitative aspects as well. These qualitative aspects consist among others of the used mix of primary energy sources, emissions of locally and globally damaging gases or radioactive and conventional waste products [16,21].

This information already exists on a non-standardised, voluntary basis. However, the identification on electricity bills or suppliers' information material by the so-called "labels" is not standardised or controlled within the EU. Therefore, the European Commission has decided in its directive on the promotion of renewable energies to oblige member countries to introduce a standardised electricity labelling system by the beginning of 2004 [24]. The same is now intended for the electricity production by CHP. This decision will be a fundamental step to empower the consumer. In the absence of a unique label system, trade with green electricity is likely to remain a niche market on a national level and close to zero at cross-border sales. Until an effective labelling system will be able to segment the electricity market into partial markets where qualitative issues count, the current competition policy of supplier will continue to focus on the quantitative aspect of electricity prices. This price-based competition is likely to have repercussions on the market structure in the short and long run and thus influences the opportunities and risks for the establishment of a sustainable electricity sector.

### *3.2. Repercussions on the market structure of a common electricity market*

#### *3.2.1. Structural reactions of established suppliers*

Before market opening, electricity supply in most European countries was guaranteed by national or regional monopolies working under government supervision. As these established suppliers find themselves in a competitive market with a high price competition, their conduct is likely to influence and change market structures. With the upcoming common electricity market, all established suppliers can acquire new customers in other European countries. Put in the terms of competition policy that means the relevant market of the supplying firms will be growing which tends to decrease supply concentration and thus vouches for a competitive market.

Empirical evidence, however, seems to contradict this argument so far. A cross-country analysis of the national EU electricity markets shows a growing trend of concentration. This suggests that generators and distributors try to avoid too strong price competition by forming co-operations, mergers or capital shares. In a bigger market, this conduct does not come as a surprise. Instead, this process might be seen as a market consolidation, where suppliers restructure to fit into the bigger single European market. It has to be noted, though, that a single European

market for electricity still does not fully exist. In most EU countries, exports or imports of electricity from other EU member states still amount to a fairly low share of overall consumption. Bearing this in mind, the question arises if the relevant market for competition policy is not still the national market. Testing supplier concentration in national electricity markets leads to alarming results. A cross-country study by Germany's Oeko Institut has tested German and the US cartel policy indicators for European electricity markets. The calculation of the concept of concentration ratios (German cartel law) and the Herfindahl-Hirshman-index (US cartel law) show that only in Great Britain and the Scandinavian countries, concentration ratios are well below the critical values. For all other countries analysed, the critical ratios are attained or exceeded, mostly also reflecting a trend of still growing concentration [25].

Especially the study's results for the German market, usually held by the European Commission as the archetype of the EU liberalisation, turn out to be surprising. According to the report, the three biggest power generators have crossed the German cartel law's critical concentration threshold of 50% market share in 2000. At the same time, the five biggest suppliers exceeded the law's threshold of a market share of two-thirds that Germany's cartel law holds as a sign for a concentration which might threaten competition [25]. With the recent merger of HEW, Bewag and VEAG into Vattenfall Europe AG, there are only four big suppliers left that cover roughly 80% of national electricity demand [26].

Apart from the problem this constitutes for competition policies on a national scale, an increase of national supplier concentration might also influence the transition towards a sustainable electricity sector in the European Union as a whole. It might be assumed that a high supply concentration represents a risk for the deployment of efficient new plants and the use of renewable energies. All suppliers having been established in the market for a long time; they recur to a centralised and depreciated plant structure which allows for high economies of scale [27]. Within this structure, renewable energies may be used to cover peak load, but are far less likely to substitute conventional plants for base load provision. At the same time, CHP plants will not be a viable option as their investment costs are too high in comparison to conventional fossil or nuclear production capacities. In the absence of government regulation for the use of renewable energy sources and CHP and the lack of an assertive demand for "green" electricity by end users, the structural reactions of the established suppliers to the increased price competition (i.e. mergers, co-operations, etc.) may well constitute a risk for the transformation towards a sustainable electricity sector.

### *3.2.2. Market entry of new and specialised suppliers and distributors*

Despite the short-term trend of growing concentration, an effective competition policy will enable the appearance and market entry of new market participants on the supply side in the long run. In addition to the already witnessed entry of established foreign suppliers into the national markets of neighbouring countries, the liberalised markets also create incentives for the appearance of new suppliers. Whilst a direct market entry is one possible option for foreign suppliers, they also

have the choice to enter indirectly by capital share acquisition of the national or regional suppliers. A direct market entry may lead to a decreased supply concentration on national markets. As for the concentration of the common market, the result is less clear. With a growing number of participations and mergers, some authors predict an oligopolistic market structure with six or less suppliers [28]. Under these circumstances, this situation may or may not foster or hinder steps towards sustainability and can only be judged by looking at the specific situation.

Seen from the perspective of a sustainable energy supply, the appearance of new market participants may support the resource and environmental goals of energy policy. On the one hand, a large number of power generators may provide for a decentralised, close-to-customer feed-in infrastructure. This infrastructure—besides lowering transport losses of electricity—fosters the use of CHP and renewable energies. On the other hand, new suppliers from different countries will facilitate electricity imports and exports. This might help exploiting the countries' potentials of renewable energies stronger than before by national or regional specialisation. For example, the southern European countries can use a high solar potential for photovoltaics, whereas northern countries have a bigger wind energy potential and Alpine countries a large amount of water generation potential [29]. Cross-border electricity trade might enable each EU member country to realise comparative generation advantages by exploiting these potentials. This might result in lower costs and prices for renewable energy sources in total.

Not all new actors need to be suppliers to promote the aims of energy policy. With the markets' innate demand for information and transaction coordination, new actors might concentrate on coordinating supply and demand [30]. Electricity brokers and power exchanges are already booming in all liberalised European markets and will probably gain importance in a common electricity market. Additionally, other service providers may appear, for example, to counsel end users on which electricity products to buy (green electricity counselling) or showing up energy saving potentials. Especially the latter "contracting" counsellors may encourage the transformation towards a sustainable energy use.

Basically, there are two forms of contracting called "energy saving contracting" or "installation contracting", respectively. With energy saving contracting, the contracting counsellor not only provides the electricity, but is also responsible for installing the needed modifying equipment. In addition, the contractor shoulders the financial burden of this investment. When the customer opts for installation contracting, the contractor will run a plant of the customer with least energy costs. In both contracting types, all parties gain from their arrangement. The contractor as an investor can refinance his investment by putting a mark-up price on regular electricity prices for the customer and engage the customer to a long-run contract. For the customers, electricity prices and consumption will, even with the mark-up, be lower than before due to efficiency gains and thus more profitable as a whole [31–33]. Without contracting, the consumer would have been able to open up some efficiency gains by using energy-efficient end use equipment. Nevertheless, coming back to an external commercial expert probably raises efficiency gains considerably.

With the appearance of new service providers, market liberalisation offers formerly undisclosed possibilities for the implementation of a sustainable electricity sector. To fully lead to a positive impact, these private service providers first have to fill a gap caused by the expiration of many governmental efficiency programmes with the regulated system. In the regulated system, governments usually urged local distributors to execute programmes for a reduction of electricity demand like least cost planning or demand side management schemes [34,35]. In many European member states, these schemes have been abolished as they were judged to be incompatible with the proceedings of a liberalised market. Most of these programmes aimed at introducing the concept of energy services.

The energy service concept considers electricity not solely as an output delivered to the consumer, but rather as an input for the generation of use energy or energy services, for example, cooled or heated food, a warm and lighted room [36]. In order to obtain these energy services, consumers need end-use equipment. That is, they need to use lamps, light bulbs, a heater, a refrigerator or an oven, the so-called "*modifying equipment*". Due to the fact that the technical properties of the equipment such as electricity consumption vary greatly, the consumer has the opportunity to reduce his or her electricity consumption (i.e. resource input and consequently local and global emissions). By this, the efficiency of end use equipment comes to the fore. This effect may seem negligible at first sight. All the same, studies of the OECD suggest that the OECD countries' household equipments taken together consume about 1100 terawatt hours of electricity per year and thus constitute about a quarter of total electricity consumption [37,38]. This potential might be reduced by taking advantage of the new service providers. Energy counsellors may aid in transforming the market for end energy (electricity) into a market for energy services and thus develop a new market segment.

## 4. Weighing the opportunities and risks: market liberalisation as a step towards a sustainable electricity sector?

Summing up the discussion, it is obvious that the liberalisation of the European electricity markets undoubtedly originated in the attempt to lower end use prices and thereby reach the aim of competitive energy costs and prices. Recent empirical data on end-user prices demonstrate that the liberalised sector in many countries seems to accomplish this aim better than with a governmental regulation. At the same time, the liberalised markets do not represent a threat to the EU's aim of the security of energy supply. What remains unclear at the current stage is the impact on the third aim of energy policy, the sparing of resources and environmentally benign energy use so as to avoid local and global emissions or for short: a transformation towards a sustainable electricity market.

With many national electricity markets being in the middle of the opening process, it is impossible to draw final conclusions at this point.

Firstly, many countries still need to decide on their concrete steps for liberalising their national market.

Secondly, the results of this restructuring process for the national markets and the common European market remain uncertain. The results will strongly depend on the new market structures, with the number and size of suppliers being a crucial aspect.

Another key issue will be how fast the new service suppliers like contracting agencies and energy counsellors will appear on the market and how the customers' reactions towards their service offers will be.

In spite of all the uncertainties, the above discussion of opportunities and risks for a sustainable electricity sector makes it clear that a negative short-term impact of market liberalisation on the environment has to be feared. Especially, the short-term price-level and price-structure effects will tend to have negative impacts. With decreasing end-use prices, the cost disadvantage of renewable energies will rise. As suppliers so far consider end use prices as the only parameter of competition, this is likely to put energy-efficient but comparatively expensive CHP plants into a disadvantageous position as well. Adding to these cost disadvantages, the probability of a continually centralised supply structure where renewable energies and CHP are only used for middle and peak load provision, the opportunities for a sustainable electricity sector seem quite bleak.

In contrast to this short-term tendency, medium- and long-run prospects look much more promising. In the long-run, with all markets liberalised and all new actors installed, electricity market liberalisation will be able to set free a considerable potential for a sustainable electricity sector, both on the supply and demand side. The increased efficiency need imposed by liberalisation will inevitably lead to the introduction of energy-efficient power plants. At the same time, the new service providers may play an important role in the restructuring of the power sector and the creation of an "empowered" consumer, who uses his buying decisions to influence the suppliers' primary energy mix and thus can induce them to use a larger share of renewable energies.

With the Keynesian saying "in the long run we are all dead" in mind, one may ask, if the tangible short-term risks of the market liberalisation are not likely to countervail the long-term opportunities, i.e. establishing insurmountable obstacles for a sustainable electricity sector. Left to the yet not fully workable market forces, this question would be a major concern for the European Union. All the same, the partly liberalised markets do not exist without a political framework. Virtually all EU member states and the European Commission underline the political responsibility to actively foster the use of renewable energies or energy efficiency and the supply and demand side [39]. With many support schemes for both fields in action, it can be hoped that many of the presented short-term risks will be overcome or at least mitigated. Thus, it appears that electricity market liberation constitutes an overall opportunity for the transformation towards a sustainable electricity supply and use—an opportunity, however, that has to be seized.

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